UPPER COLORADO
2002 WATER YEAR IN REVIEW

A LOOK BACK AT LAST YEAR....

This is a summary of the 2002 Upper Colorado River Basin water supply forecasts and subsequent observed runoff volumes where available. Volume forecasts and observations are for the April-July period (except where indicated) and are expressed in 1000's of acre-feet. Averages used are for the 1971-2000 period.

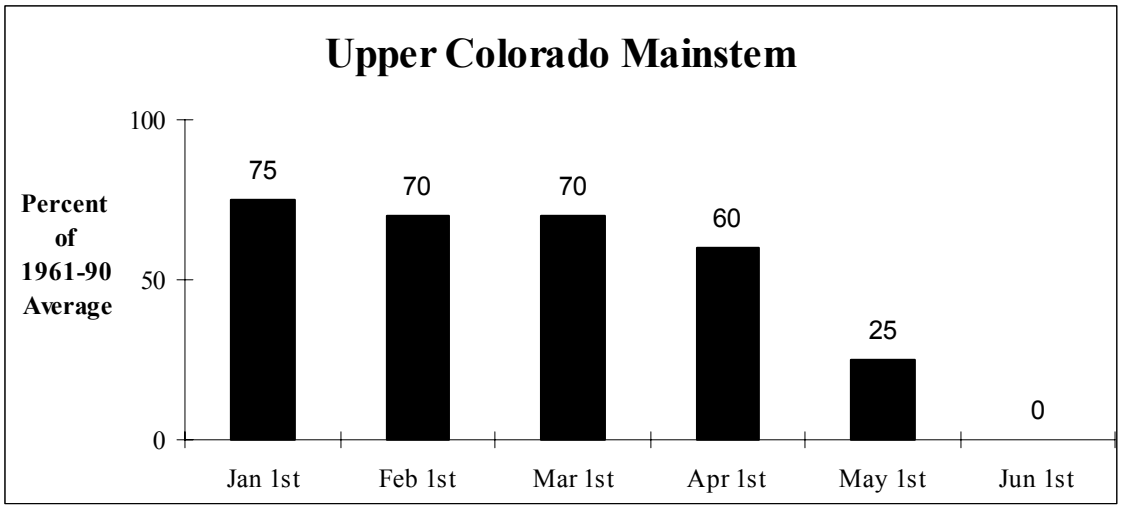
This product is designed to assist individuals and agencies with water supply concerns in summarizing last year's (2002) spring runoff and in planning for the coming year.

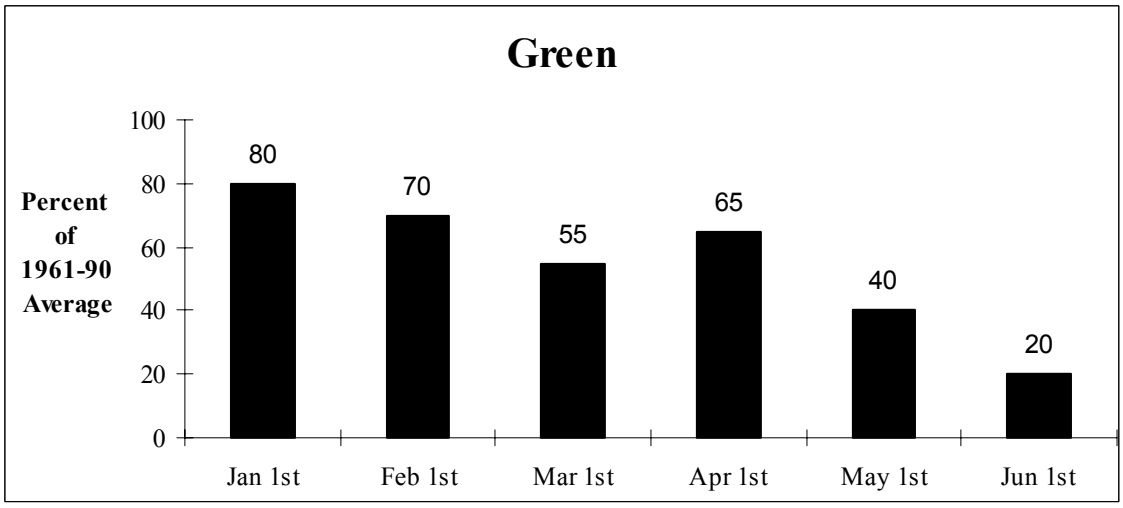
Please note that all observed values are provisional. Final values may differ from those listed herein. Many adjustments for diversions have been estimated from historical averages. In extreme years these *average* estimates may result in large discrepancies between provisional and final values. In addition, during hot, dry summers both unknown/unmeasured diversions and environmental losses due to evaporation and channel transmission tend to increase. Total abstractions, engineered and environmentally induced, may cause natural flow calculations to yield a number less than zero, particularly at locations well downstream. At such locations, comparisons between forecast and observed flows become more difficult and less meaningful.

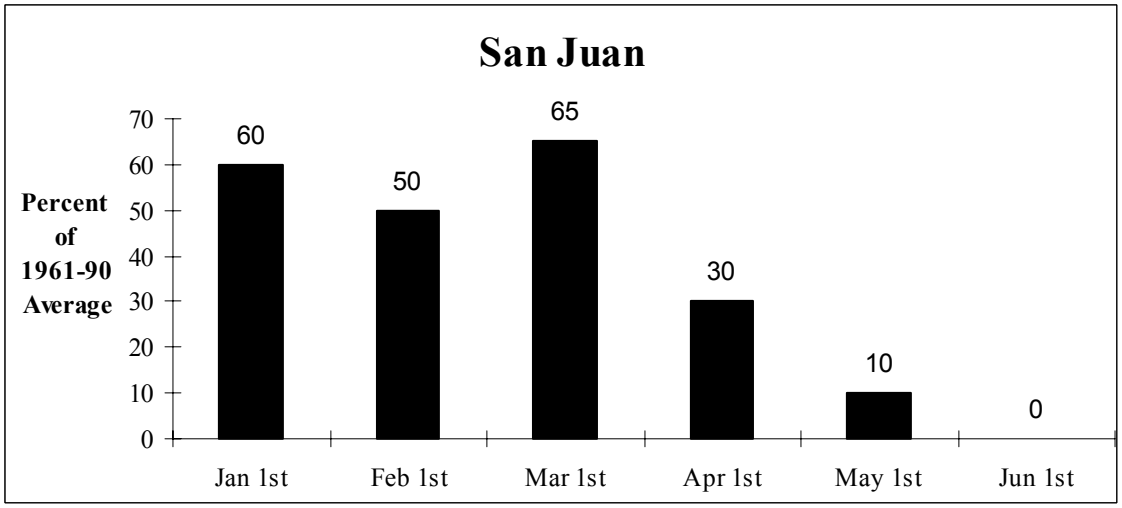
Included in this review is expanded treatment of the confidence intervals associated with forecasts. The reasonable maximum and minimum values, which form the boundaries of the confidence interval, are statistical measures reflecting both the accuracy of the regressions equation used to produce the forecast and the natural variability of streamflow volume. As the forecast season progresses, confidence intervals should narrow as meteorological conditions become known. The most probable forecast, a 50% exceedance probability, is most often cited. However, the reasonable minimum, a 90% exceedance probability, and maximum, a 10% exceedance probability, are important indicators of the "confidence" of the most probable forecast. Under normal meteorological circumstances, observed flows will fall within the confidence interval 80% of the time; flows may occur outside interval boundaries in years exhibiting uncharacteristic conditions.

SPRING 2002 SNOWPACK REVIEW

Snow Water Equivalent







2002 Forecast Summary for: UPPER COLORADO MAINSTEM

April-July volumes unless otherwise noted

STREAM	STATION	JAN	FEB	MAR	APR	MAY	JUN	OBS	%AVG
COLORADO	LAKE GRANBY, GRANBY, NR	170	165	165	145	125	105	88	39
	HOT SULPHUR SPRINGS	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
	DOTSERO, NR	1100	1000	1000	825	675	530	406	28
	GLENWOOD SPRINGS, BLO	1730	1500	1430	1250	925	765	642	30
	CAMEO, NR	1850	1700	1600	1340	970	820	714	30
	CISCO, NR	3000	2700	2300	1850	1180	1000	1040	22
WILLOW CK	WILLOW CK RES, GRANBY, NR	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
FRASER	WINTER PARK, NR, UPR, STATION	17	15.5	15	13	11.5	10	7	35
WILLIAMS FORK	WILLIAMS FORK RES, PARSHALL, NR	65	65	68	59	55	45	30	32
EF TROUBLESOME CK	TROUBLESOME, NR	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
BLUE	DILLON RES	130	125	135	105	75	70	52	31
	GREEN MTN RES	225	215	235	185	145	115	91	32
EAGLE	GYPSUM, BLO	265	265	265	200	145	130	119	36
FRYING PAN	RUEDI RES, BASALT, NR	105	100	100	80	68	58	41	29
ROARING FORK	GLENWOOD SPRINGS	575	500	450	400	285	260	231	33
PLATEAU CK	CAMEO, NR	70	65	50	30	20	17	12.8	11
TAYLOR	TAYLOR PARK RES	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
	ALMONT	115	98	95	72	60	50	46	28
EAST	ALMONT	140	130	120	105	70	65	64	33
GUNNISON	GUNNISON, NR	270	240	220	173	112	95	93	24
	GRAND JUNCTION, NR	990	825	735	600	350	340	307	20
MUDDY CK	PAONIA RES, BARDINE, NR	75	58	38	26	19	18	16.7	16
NF GUNNISON	SOMERSET NE	215	187	157	130	98	95	87	29
SURFACE CK	CEDAREDGE	11	10	9	7.8	6	5	5.6	33
UNCOMPAHGRE	RIDGWAY RES	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
	COLONA	95	82	77	60	49	35	30	22
	DELTA	80	60	60	45	40	25	12.8	11
DOLORES	DOLORES	180	160	130	100	53	45	47	18
	MCPHEE RES	200	180	150	110	60	47	49	15
	CISCO, NR	315	265	140	100	50	30	20	4
SAN MIGUEL	PLACERVILLE,NR	95	95	80	63	32	32	32	24
	NATURITA	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
MILL CK	MOAB, NR, SHELEY TUN, AT	5	3.5	3	2	1.7	1.4	N/A	N/A
INDIAN CK	MONTICELLO, NR, BOGUS POCKET ◆	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A

◆ March-July Forecast Period

Provisional Flows in 1000 Acre - Feet

2002 Forecast Summary for: GREEN RIVER BASIN

April-July volumes unless otherwise noted

STREAM	STATION	JAN	FEB	MAR	APR	MAY	JUN	OBS	%AVG
GREEN	DANIEL, NR, WARREN BRIDGE, AT	225	215	205	220	210	175	172	65
	GREEN RIVER, WY, NR	650	600	550	550	500	355	314	36
	GREEN RIVER, UT	2160	2050	1900	1550	1260	850	708	22
PINE CK	FREMONT LK, ABV	88	82	75	85	80	68	N/A	N/A
NEW FORK	BIG PINEY, NR	315	290	275	265	240	190	162	41
BIG SANDY	FARSON, NR	49	46	43	41	34	34	33	57
BLACKS FK	MILLBURNE, NR	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
EF SMITHS FORK	ROBERTSON, NR	21	19	19	17.2	14.8	14.5	12.8	41
HAMS FORK	FRONTIER, NR, POLE CK, BLO	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
	VIVA NAUGHTON RES	65	58	58	50	42	34	N/A	N/A
YAMPA	STAGECOACH RES, BLO	20	20	20	18.1	12.8	12	N/A	N/A
	STEAMBOAT SPRINGS	195	185	185	165	125	120	89	32
	MAYBELL, NR	695	630	640	465	335	325	278	28
ELKHEAD CK	ELKHEAD, NR	28	25	25	20	11.5	11.5	N/A	N/A
FORTIFICATION CK	FORTIFICATION, NR	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
LITTLE SNAKE	SLATER, NR	100	90	93	78	74	55	50	31
	DIXON, NR	200	180	185	150	142	105	N/A	N/A
	LILY, NR	220	190	200	165	154	110	84	23
BIG BRUSH CK	VERNAL, NR RED FLEET RES, ABV	15.5	14.3	13.8	12.5	9.6	8.3	6.1	29
ASHLEY CK	VERNAL, NR	42	38	33	29	20	18.3	10.6	20
WF DUCHESNE	HANNA, NR	16.8	15	15	12	8.8	8.5	N/A	N/A
ROCK CK	UPPER STILL WATER RES	60	56	49	42	34	31	N/A	N/A
	MTN HOME, NR	65	60	52	50	34	34	36	40
DUCHESNE	TABIONA, NR	70	64	64	60	44	37	38	36
	DUCHESNE, NR, KNIGHT DIV, ABV	125	110	100	90	70	64	N/A	N/A
	MYTON	156	143	125	90	38	38	26	10
	RANDLETT, NR	195	175	145	90	53	42	26	8

Provisional Flows in 1000 Acre-Feet

2002 Forecast Summary for: GREEN RIVER BASIN

April-July volumes unless otherwise noted

STREAM	STATION	JAN	FEB	MAR	APR	MAY	JUN	OBS	%AVG
STRAWBERRY	SOLDIER SPRINGS, NR	43	35	32	25	14.3	14.3	15.9	27
	DUCHESNE, NR	90	73	65	49	33	30	25	21
CURRANT CK	CURRANT CK RES	16.3	13.3	12.3	8.8	5.2	5	N/A	N/A
LAKE FORK	MOON LK RES, MTN HOME, NR	49	44	44	37	31	31	26	38
YELLOWSTONE	ALTONAH, NR	42	38	38	35	27	27	21	34
WHITEROCKS	WHITEROCK, NR	48	42	35	30	20	18.7	16	29
WHITE	MEEKER, NR	200	190	185	160	114	110	89	31
	WATSON, NR	210	195	190	165	118	114	75	25
GOOSEBERRY CK	SCOFIELD, NR	10.1	7.1	6.8	5.9	5.2	6.3	N/A	N/A
PRICE	SCOFIELD RES, SCOFIELD, NR	41	29	24	21	17.5	15	N/A	N/A
WHITE	BLO TABBYUNE CK, SOLDIER SUMMIT	12	10.1	8.5	7	4.5	3	N/A	N/A
HUNTINGTON CK	ELECTRIC LAKE	12	9	8	7	5.6	5.6	N/A	N/A
	HUNTINGTON, NR	42	36	29	24	18.5	18.5	N/A	N/A
SEELEY CK	JOES VALLEY RES, ORANGEVILLE, NR	46	40	34	28	27	25	N/A	N/A
FERRON CK	FERRON, NR	36	28	25	21	18.3	16.6	17.4	45
SEVEN MILE CK	FISH LAKE, NR	7	5.5	5.1	4	3.2	3	N/A	N/A
MUDDY CK	EMERY, NR	18.3	15.3	13.7	11	8.6	7.5	8.5	43

Provisional Flows in 1000 Acre-Feet

2002 Forecast Summary for: SAN JUAN BASIN

April-July volumes unless otherwise noted

STREAM	STATION	JAN	FEB	MAR	APR	MAY	JUN	OBS	%AVG
SAN JUAN	PAGOSA SPRINGS	150	120	95	75	43	35	23	10
	CARRACAS, NR	245	230	185	118	84	59	41	10
	FARMINGTON	750	580	395	380	100	87	57	5
	BLUFF, NR	750	590	400	280	62	46	32	3
RIO BLANCO	PAGOSA SPRINGS, NR, BLANCO DAM	36	31	24	17.5	10	7.5	6.4	12
NAVAJO	CHROMO, NR, OSO DIV DAM, BLO	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
PIEDRA	ARBOLES, NR	145	115	95	65	46	25	16.6	7
LOS PINOS	VALLECITO RES, BAYFIELD, NR	132	120	77	55	46	37	36	18
ANIMAS	DURANGO	310	270	200	156	100	89	83	19
FLORIDA	LEMON RES, DURANGO, NR	37	34	25	17	16.4	12	8.9	15
LA PLATA	HESPERUS	18	14	11	6	3.6	3.6	3.5	14
MONTEZUMA CK	MONTICELLO, GOLF COURSE, AT ◆	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
RECAPTURE CK	BLANDING, NR, JOHNSON CK, BLO ◆	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A

◆ March-July Forecast Period

Provisional Flows in 1000 Acre - Feet

What makes a **GOOD** water supply forecast?... a **BAD** forecast?

Is it as simple as which forecast comes closest to the actual observation? Probably not, as a number of factors necessitate a more sophisticated evaluation of forecast quality be undertaken. Such an evaluation would not be trivial and is beyond the time and space constraints of this note. Nonetheless, with apologies for simplification and omission, some of the factors include:

subsequent meteorologic conditions - the implicit assumption behind any forecast is that the meteorologic conditions during the remainder of the snow accumulation and melt season will be "normal." While it may be difficult to adequately define what "normal" is, it is easier to discern conditions that are extreme or "not normal." As such, a given forecast at a given time may have been the best forecast possible in light of known conditions, although ultimately turning out to be 20% too low; it just so happened that the ensuing meteorologic conditions were unusually wet. Just as a good forecast may be made to look bad by abnormal conditions in the future, the reverse situation is also possible.

natural variability of site's streamflow - simply put, some rivers are much more difficult to forecast then others. Historically, such river flows may vary over a wide range and be quite sensitive to changing conditions, particularly in environs where the number of precipitation events are few. On the other hand, some river flows may be relatively constant with the effects of diverse conditions dampened. Oftentimes scale is a good indicator of the variability of flow at a given site. A 20% error on a small stream in Arizona may be more laudable than a 10% error on Lake Powell inflow.

character of the year - by definition, extreme events are rare and forecasting such events become more difficult. Because the number of past extreme events is small, less is known about the distribution and variability than in situations with "near-normal" populations. Even if it was possible to remove uncertainty about future meteorological conditions, there would still be more error associated with forecasting extreme events.

During the extreme conditions there is a demand that the forecaster make a more powerful (and potentially more valuable) statement: in effect, that "even normal conditions from here on out will not be enough to compensate for current abnormal snowpack and soil states." It is during such events that consideration of information other than just the most probable forecast become especially important. Probability statements that convey the likelihood of exceeding a certain level (such as the reasonable maximum and minimum forecasts) help to underscore the uncertainty associated with the forecast.

So why do it? although it may not be a simple matter to grade a forecast, it is still useful for users and forecasters alike to review the previous year's forecasts and adjusted observations (provisional as they may be with estimated diversions) so as to act on obvious problems and to gain perspective for the coming forecast season.

Additional Information

Water supply forecasts take into consideration present hydrometeorological conditions and use average basin temperatures and precipitation for the forecast period. As the forecast season progresses, a greater portion of the future hydrologic and meteorological uncertainty becomes known and monthly forecasts become more accurate. Volume forecasts represent adjusted flows; that is, observed flows with upstream water use taken into account. At best, adjusted flows will closely approximate natural or unimpaired flows.
However, not all upstream diversions or impoundments are measured, quantifiable or predictable.

The Water Supply Outlook is issued monthly January through May by the Colorado Basin River Forecast Center, National Weather Service. It represents a coordinated effort between the National Weather Service, soil Conservation Service, Bureau of Reclamation, U.S. Geological Survey and local water district managers.

DEFINITIONS:
Acre-Foot:
The volume equal to one acre covered one foot deep (43,560 cubic feet).

Average:
The arithmetic mean. The sum of the values divided by the number of values.

Categories:

Much above Average	Above Average	Near Average	Below Average	Much below Average
Greater than 30%	111 - 130%	90 - 100%	70 - 89%	Less than 70%F

Forecast Period: The period from April 1 to July 31.

Most Probable Forecast:
Given the current hydrometeorological conditions to date, this is the best estimate of what the runoff volume will be this season.

Reasonable Maximum Forecast:
Given the current hydrometeorological conditions, the seasonal runoff that has a ten percent (10%) chance of being exceeded.

Reasonable Minimum Forecast:
Given the current hydrometeorological conditions, the seasonal runoff that has a ninety percent (90%) chance of being exceeded.

Water Year: The period from October 1 through September 30.
NOTE: Data used in this report are provisional and are subject to revision.
For more information, or to be included on the mailing list, please contact:
Colorado Basin River Forecast Center, National Weather Service
2242 West North Temple, Salt Lake City, UT 84116, (801) 524-5130